

## Claims

1. A method for producing a semiconductor device, which has a trench gate structure, being characterized by comprising the steps of:

forming an oxide film by a Chemical Vapor Deposition method on an inner wall of a trench formed in a semiconductor substrate;

forming a thermally oxidized film on an interface between the oxide film and the semiconductor substrate by a thermal oxidation method; and

forming a gate insulating film comprising the oxide film and the thermally oxidized film in the trench.

2. The method for producing the semiconductor device according to Claim 1, being characterized in that the oxide film is formed by a reduced pressure CVD method.

3. The method for producing the semiconductor device according to Claim 1, being characterized in that the oxide film is formed by using a gas comprising dichlorosilane and dinitrogen monoxide as a raw material.

4. The method for producing the semiconductor device according to Claim 1, being characterized in that the oxide film is formed by using a gas comprising monosilane and

dinitrogen monoxide as a raw material.

5. The method for producing the semiconductor device according to Claim 1, being characterized in that the oxide film is formed such that it has a film thickness of from about 50% to about 90% of that of the gate insulating film to be finally formed.

6. The method for producing the semiconductor device according to Claim 1, being characterized in that the thermally oxidized film is formed on an interface between the oxide film and the semiconductor substrate by a pyrogenic oxidation method.

7. The method for producing the semiconductor device according to Claim 1, being characterized in that the thermally oxidized film is formed on an interface between the oxide film and the semiconductor substrate by a high-temperature-dilution pyrogenic oxidation method which is performed by diluting a reaction gas with an inert gas and is performed with high temperature.

8. The method for producing the semiconductor device according to Claim 7, being characterized in that the high-temperature-dilution pyrogenic oxidation method is

performed at a temperature of about 950°C or more.

9. The method for producing the semiconductor device according to Claim 1, being characterized by comprising the steps of:

forming the gate insulating film; and

performing an annealing treatment in an atmosphere of nitrogen.

10. The method for producing the semiconductor device according to Claim 9, being characterized in that the annealing treatment is performed at a temperature of from about 850°C to about 1000°C.

11. A method for producing a semiconductor device, which has a trench gate structure, being characterized by comprising the step of:

forming an oxide film on an inner wall of a trench formed in a semiconductor substrate by a Chemical Vapor Deposition method using a gas comprising dichlorosilane and dinitrogen monoxide as a raw material.